# TABLE OF CONTENTS



## Figures

# 3.1 INTRODUCTION

## 3.1.1 Background

The Department of Water Resources (DWR) Delta Levees Program provides state support for local agencies to maintain and improve levees in the Sacramento–San Joaquin River Delta (Delta) and has done so (at various levels of funding) since 1973. The program evolved into its present form with various legislative changes, including Senate Bill 34 (in 1988) and Assembly Bill 360 (in 1996). The Delta Levees Program now has two parts. The Delta Levees Maintenance Subvention Program (Subvention Program), which provides matching funds to assist with levee maintenance and improvements, is available to all levee-maintaining agencies throughout the Delta. The Delta Levees Flood Control Special Projects Program (Special Projects Program), which is designed for less-routine efforts, supports work on islands of special importance.

The Special Projects Program has historically been focused on the eight western Delta islands. With proposals to increase funding for the overall Delta Levees Program, consideration is now being given to extending the Special Projects Program to additional territory. Recent funding of the Delta Levees Program has usually been split about 50/50 between the Subvention Program and the Special Projects Program, after deducting state operation costs.

Building Block 1.1 focuses on the Subvention Program—the Delta-wide program for levee maintenance and routine repair/improvement projects. Figure 3-1 shows the flash card for Building Block 1.1: Improved Delta Levee Maintenance.

The funding arrangements for the Subvention Program provide for state reimbursement of up to 75 percent of the costs that a local maintaining agency incurs in excess of $1,000 per eligible mile of levees in its district. In recent years, state funding for the Subvention Program has been about $6 million per year. The annual participation typically includes 60 to 70 levee-maintaining agencies, and the amounts participants claim for reimbursement are typically twice the available funds.

DWR conducts the program jointly with the California Department of Fish and Game (CDFG) (which looks out for environmental mitigation needs and enhancement opportunities). DWR, CDFG, the local districts, their consulting engineers, and other Delta stakeholders all view the program as being extremely effective in terms of cooperation and accomplishments relative to the funds expended. Data from recent Delta Levees Programs (both the Subvention Program and the Special Projects Program) indicate that the overall rate of Delta levee failures has decreased from one failure per year (on average) to one failure every 2 years (Figure 3-2).

The Subvention Program has suffered from uncertainty—erratic funding and frequent expirations of key legislative authorizations. Strong sentiment exists among stakeholders to resolve this difficulty through a state legislative commitment to sustained and increased funding of the program.

The program also has two administrative circumstances that might be refined to improve its effectiveness in handling the increased funding:

- The first administrative circumstance is the timing of the state budget and the program-approval/funds-availability cycle. Even with on-time budget approval by the Legislature and

Governor, normal or expedited program approval (DWR and the Central Valley Flood Protection Board), and funds availability (Department of Finance), it can be late September or October before projects are approved and current fiscal-year funds become available. However, per environmental regulations the construction calendar window for levee work on the waterside of levees closes on October 31.

Thus, the only way local maintaining agencies can accomplish work within the fiscal year is to fund it themselves with their own cash or relatively expensive loans (or hope Subvention Program funds are still available in the following spring). This approach is risky for local agencies because (in the first part of the fiscal year) they do not know what funds will be made available to the Delta Levees Program or whether their own projects will be approved for expenditure reimbursement. However, if they wait until the next spring to seek funding, the money may no longer be available.

Financing the program with loans (to get an early start) is expensive and means that local agency funds are used for interest payments instead of levee work. Interest is not a reimbursable expense. Thus, every dollar spent on interest is not a dollar available as the local agency's obligatory 25 percent match for state funds. Therefore, for each dollar a local agency spends on interest to service the loans, 4 dollars worth of levee work cannot occur.

- The second administrative circumstance is that of achieving timely advances or progress payments once the local agency's project has been approved. Improved procedures would again mean less interest cost to the local agencies and more local funds available for matching state funding assistance for actual levee work.

  Currently, before receiving advance funds, the local agency must obtain CDFG certification that all necessary mitigation is addressed. Right now, this procedure is handled on a case-by-case basis; if the mitigation is properly addressed by the program and credited to districts, it would facilitate more rapid processing of funds. It is in the state's interest to minimize the local agency's need to spend money on interest so that the agency can accomplish the maximum possible amount of levee work. With prompt advances and progress payments, levee maintenance would be increased.

### 3.1.2 Purpose and Scope of Building Block

The purpose of Building Block 1.1 is to enhance levee maintenance through more continuity, programmatic mitigation, and a higher level of state support of the Subvention Program. Specifically, this building block considers a state commitment (legislative and DWR) to provide continuously appropriated, sustained, increased funding for the Subvention Program at either twice the present level (i.e., about $12 million/year) or four times the present level (i.e., about $25 million/year).

If the local assistance funds were kept solvent and could be appropriated as needed to support work in progress, work agreements could be prepared and approved before passage of the state budget. This procedure would allow the local agencies to take advantage of the calendar window for waterside work. It should be noted that this building block would require legislative action to extend the existing program, provide continuous appropriation, and provide the funding

necessary to support the levee maintenance work. On expiration of presently available or follow-up bond funding, the Legislature would have to commit general funds to annual appropriations.

Annual Subvention Program funding that is continuing and predictable is important to prevent the deterioration of Delta levees. The benefits would include lessening the risk of levee failures, protecting the functionality of Delta assets and infrastructure, and providing continuation of Delta services received by the state. Additional refinements in the Subvention Program may be considered to facilitate program administration and the timing of the availability of funds.

The scope of this building block does not include consideration of increased funding for the Special Projects Program or consideration of the increased administrative costs that would be associated with the increases in Subvention Program funding.

### 3.1.3 Objective and Approach

The objective of Building Block 1.1 is enhanced levee maintenance within the existing Subvention Program structure through increases in the amount of state financial support, improved availability of funding, and continuity of funding. This building block assumes that the existing concept of levee maintenance (in which the primary responsibility for levee maintenance remains with the levee-maintaining agencies) and the present approach for local cost sharing would be continued. This building block also assumes that mechanisms will be created to improve administrative procedures to effectively deal with increased funding, including procedures for scheduling annual program funding/approval and concerning advance/progress payments.

## 3.2 CONCEPTUAL DEVELOPMENT OF IMPROVEMENT

### 3.2.1 Analysis Criteria and Basis of Design

As indicated by the present level of reimbursement requests, DWR expects a $12 million/year Subvention Program to be fully subscribed under current cost-sharing rules.

For a $25 million/year Subvention Program, local agency funding would need to increase to take full advantage of the available state funding, if present cost-sharing rules were continued (25 percent + $1,000/eligible levee mile). This building block assumes the necessary increase in local funding would be possible.

Some projects considered under this increase in the Subvention Program might be better described as major levee upgrades (see Section 4, Building Block 1.2: Upgraded Delta Levees). It is assumed that such projects would be discouraged from funding under the Subvention Program by making more attractive terms available under Building Block 1.2.

It is also assumed that major upgrade projects will not divert local district maintenance funding away from the local matching needed for the Subvention Program. These potential side effects must be carefully considered while developing an integrated overall program for Delta levee maintenance and improvement.

### 3.2.2 Analysis Results

With increased funding under both options for Building Block 1.1, it should be possible to take more proactive maintenance initiatives, such as routine, periodic electromagnetic surveys to identify levee anomalies and immediately address levee sections with potential weaknesses due to rodent dens, seepage zones, or other deficiencies. More proactive surveying with prompt observation and remediation of levee settlement should be possible and should result in maintenance of design crest elevations and levee cross sections. Also, waterside erosion repair and maintenance of slope protection should occur promptly.

Over time, sea-level rise and the increasing frequencies of floods will require crest raises to maintain compliance with the Hazard Mitigation Program (HMP) and Public Law (PL) 84-99 standards. Under the higher level of increased funding, efforts to keep up with sea-level rise are more likely to be successful. An additional advantage of a stable, predictable level of funding is that local districts would be able to plan larger-scale, multi-year projects without the present fear that funding may not be available in the year or years after the initial funding.

### 3.2.3 Values, Benefits, and Constraints

For the foreseeable future, state and local interests are jointly dependent on proactive maintenance of the Delta levees. The Subvention Program is an appreciated and effective mechanism for state participation that recognizes local leadership and responsibility for levee maintenance.

The local agencies cannot keep up with maintenance needs without improved Subvention Program continuity and predictable state annual support. An increased level of state funding is also needed. When the increases in annual funding being considered are granted, keeping up with maintenance needs will be an achievable goal, and efforts to catch up on deferred maintenance or to improve levees will be an added benefit. The degree of progress will depend on the funding increase chosen.

The Subvention Program is fundamentally a maintenance program that is able to accomplish modest improvements in that context. Participants recognize that this will not overcome the fundamental weaknesses of the Delta levees that stem from inadequate design, poor foundation materials, and the failure to use sound construction materials and procedures when the levees were originally built.

## 3.3 COST ESTIMATES

The two options for improved levee maintenance through increased continuity and predictability of state support for the Subvention Program and increased amounts of annual state funding are:

- Option 1: Subvention Program funded at $12 million per year (an annual cost increase of $6 million)
- Option 2: Subvention Program funded at $25 million per year (an annual cost increase of $19 million)

## 3.4 RISK REDUCTION ESTIMATE

### 3.4.1 Direct Risk Reduction

Given the voluntary nature of this program and the random nature of levee breach events, the results of the two options for increases in Subvention Program funding are hard to predict. Local districts are expected to participate, but they may not for a variety of reasons, often involving limitations on local funding. However, for the local districts that do take advantage of the Subvention Program, it is anticipated that the levees would continue to be maintained by staff with a vested interest in levee stability, the levees would be better maintained than they are at present, some crest elevations would be raised in response to sea-level rise, and the risk of levee failure would be decreased. This last result will principally be achieved by proactive discovery of weak spots and deteriorating situations and their prompt correction. Thus, this building block will aid districts in reducing future sunny-day failures and maintain compliance with applicable levee standards, such as the HMP standard or the PL 84-99 standard.

### 3.4.2 Estimation of Risk Reduction

The objective of the Subvention Program is to enhance levee maintenance, including improved monitoring (i.e., electromagnetic surveys), stopping or arresting deterioration, rodent control, and repair of local vulnerabilities (i.e., settlement). Relative to historical experience, an improved maintenance program offers the opportunity to reduce the rate at which sunny-day (e.g., 2007 Staten Island piping) and flood-related failures occur (see Figure 3-2).

If funding for the subventions program is increased, it is reasonable to expect that the rate of levee failures for sunny-day events and at least for some flood events will be reduced. This expectation is supported by the historical record (see Figure 3-2). However, the degree to which the current rate of failures may continue to decrease given increased Subvention Program funding is not known. In terms of the consequences of levee failure and island flooding (if a failure were to occur), an improved Subvention Program will have no impact. Thus, in terms of the total risk of island flooding and the consequences of these failures estimated in Phase 1 (life safety, economic, ecosystem), the contribution of this building block to risk reduction will be small.

Although the overall risk-reduction benefit of an improved maintenance program may be small, it is at the same time a sound investment. An inherent sound practice for operating any system (e.g., civil infrastructure, power plant) is to establish and implement an effective maintenance program.

- For major floods, some benefit could be expected from this building block in preventing premature breaching due to weak-point seepage or overtopping enabled by a low point in the levee crest. In many cases, this benefit may provide only a delay or a change in location for an island-flooding breach that will still occur.
- The Subvention Program is not expected to have benefits in reducing the number of seismic failures.

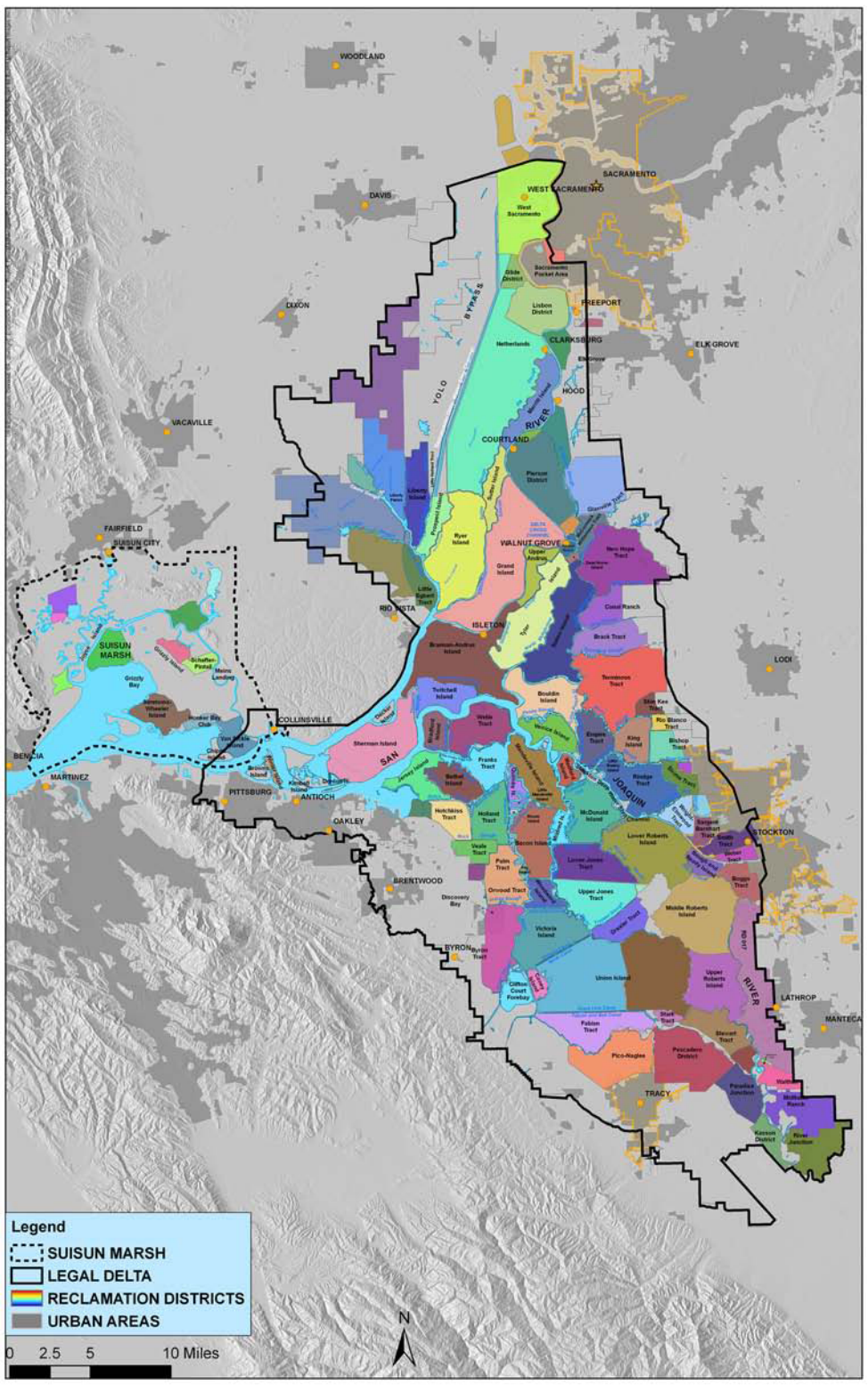
In general, the Subvention Program would be expected to be much more effective than the current business-as-usual approach in meeting routine maintenance needs. However, the inherent

weaknesses of the levees due to their history of development (generally without rigorous design and construction techniques) would still leave them vulnerable to major floods and earthquakes.

## 3.5 FINDINGS AND CONCLUSIONS

The primary contribution of increased Subvention Program funding will be to decrease the rate of occurrence of levee breaches from sunny-day events and at least some floods (small- and medium-sized floods). The program has already demonstrated success in this regard. Increased continuity of funding and greater annual funding should build on this success.

# Figures




## Improved Maintenance Options

- Increased funding for Delta Levees Maintenance Subvention Program
  - –Option 1 – Increase to $12 million/year
  - –Option 2 – Increase to $ 25 million/year
- Either option requires legislative extension of the program and also needs to address year to year continuity of funding

## Improved Maintenance Purpose

- Encourage/facilitate local efforts to maintain levees and detect/address problems
- Maintain Delta configuration, protect lives, infrastructure and property, and provide continued functionality of various Delta services

## Improved Maintenance Benefits

- Reduce vulnerability to certain modes of failure (animal burrows, seepage/piping zones, crest low points)
- Increase ability to respond to developing events
- Reduce risk of failures from sunny-day events and moderate floods

## Improved Maintenance Risk Reduction Estimates

- $12 million/year (Option 1)
  - –Decrease sunny-day and small/medium floods by approximately a factor of 1.5
  - –Increase large flood threshold to 500,000 cfs
- $25 million/year (Option 2)
  - –Decrease sunny-day and small/medium floods by a factor of 2
  - –Increase large flood threshold to 700,000 cfs

## Improved Maintenance Issues / Concerns

- Construction window (calendar months when construction is permitted) is mostly past when fiscal year budget and program is approved and funds become available
- Interest payments by local districts use up their capacity for the 25% local match because interest costs are not reimbursable by the Subvention Program
- System for funding advances or progress payments is not effective
- Higher funding option may exceed local match capability

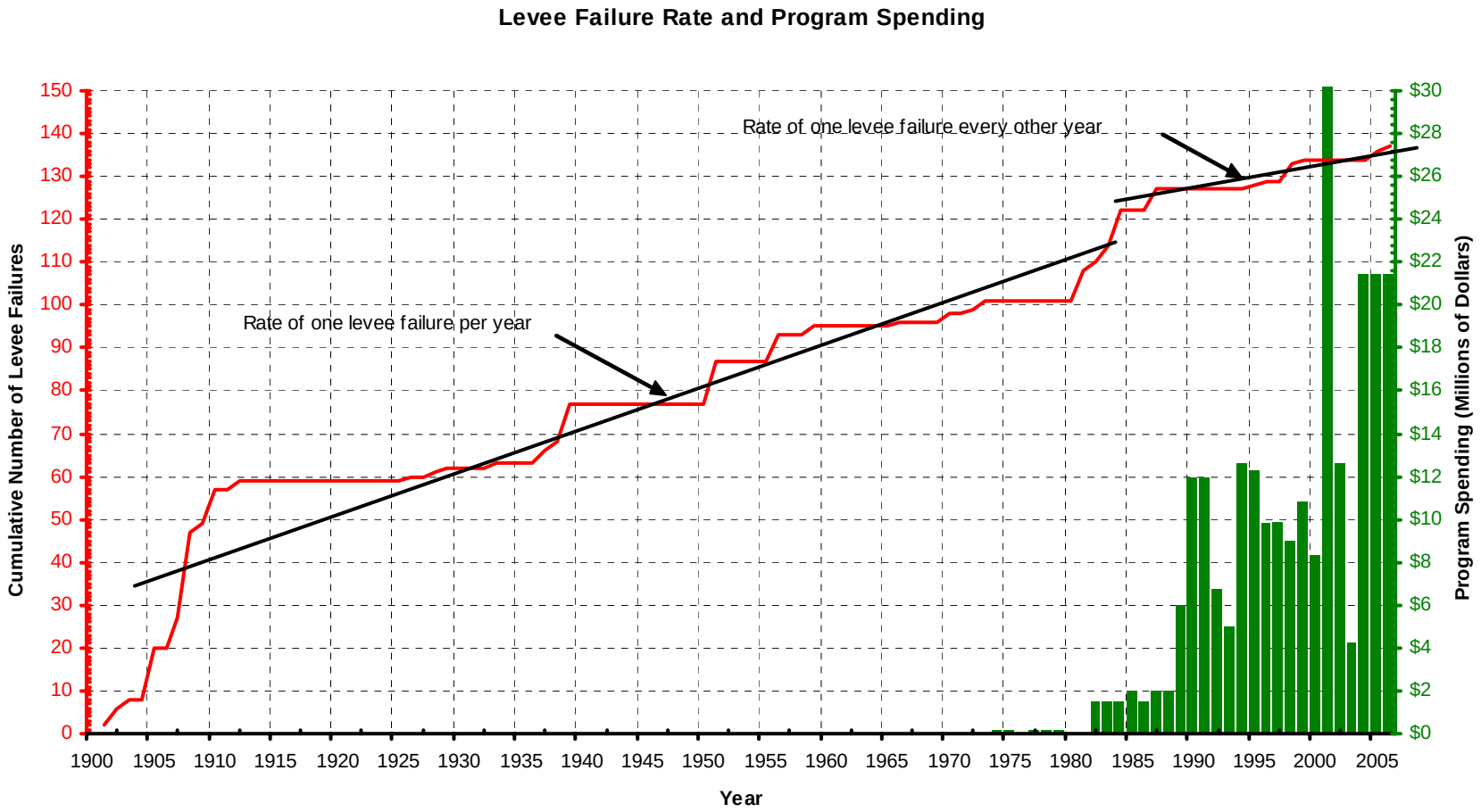



**Figure 3-2 Levee Failure Rate**

Note: The program spending (right axis) is the overall Delta Levees Program state funding (based on year spent, not appropriations). Since 1992, the Subvention Program has been approximately half of the residual after deducting state operating costs and has recently been about $6 million per year.

Source: Figure provided by Mr. David Mraz, California Department of Water Resources, Chief, Delta–Suisun Marsh Office.